TOWARDS CENTRALISED COMPUTERISATION OF HEIs IN KERALA

The Kerala State Higher Education Council

2022

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Preface

Transformation of educational institutions into a system of digital technology aided management, teaching and learning is not optional anymore today. Universities and Colleges in the State have been under computerisation over a couple of decades but without the expected results due to the inept way, inescapable for beginners in the process. Nevertheless, two decades are long enough to attain proper system design, operational reliability, quality output, and security. Evidently computerisation is encountering retardation that necessitates probing. Hence the first task of this document is to provide a detailed assessment of hindrances that impede successful computerisation of Universities.

Naturally the opening chapter of this document deals with the reasons for the failure of computerisation in our Universities. M.V. Harikrishnan has done there a beautiful study of hindrances of computerisation at the university level. His analysis of the causality, corrective measures, persistence of retardation and the alternative is brief but impressively exhaustive. Centralisation is the proposed alternative, without which Information Technology (IT) cannot operate ensuring optimal speed, efficiency, quality of service and benefits.

In the wake of the pandemic lockdown, when Online teaching/learning had become a new normal, most institutions were forced to provide the basic IT infrastructure. But teaching Online has been mere lecturing through the microphone and acting before the video camera, precluding not only the benefits of Offline education but also the advantages of ICT. Like Universities, Collegeas have been developing their own IT infrastructure for teaching/learning and administration, unevenly though. Most of them are yet to attain the full benefits of a digitally equipped environment for administration, teaching and learning. Realising the need for centralisation, the Higher Education Council in collaboration with the Digital University began efforts to uniformly transform the Colleges into the system of digital technology aided pedagogy and administration.

It is extremely important to quantitatively and qualitatively assess the infrastructural and academic preparedness of HEIs in the state before planning their transformation into the environment of digital technology aided teaching/learning. Actually we need a detailed survey of digital teaching/learning facilities in the colleges and the skills attained by the teachers. What we have at our disposal is the data generated by KSHEC as part of a detailed survey not complete as yet. It provides an overall understanding of the techno-

educational infrastructure and the current working skill status. We have a dependable mapping of the connectivity reach and the problem of access. This is enough to decide what needs to be done to address an issue under emergency.

The Higher Education Council and the Digital University jointly launched a resource-frugal Digital Enablement Project to provide each college the facility easily, quickly, and with relatively less expense. What we sought to achieve as the first task was bringing the pedagogy and governanace of the Colleges under an Open Source Software Solution and a flexible platform. We prescribed the Moodle platform with a Learning Management System (LMS) customised for each college to run teaching/learning activities effectively Online, Offline and the Blended mode. The Project aimed at enabling the Colleges to use LMS as a reliable record of teaching/learning performances and a basis of assessment.

How to enable all colleges to use digital tools and internet was what we thought urgent as a crucial measure of quality assurance. We targetted the low income Colleges to have the installation of Moodle (not expensive) and customisaation of LMS (not affordable individually for them). Hence we jointly initiated steps to make the customised LMS server centrally available to all Universities and Colleges through the Digital University's Data Centre. This joint Project of computerisation of HEIs under a setup of Statewide centralisation has been progressing as a movement called Digicol.

Prof. Rajan Gurukkal (Vice Chairman KSHEC)
Prof. Saji Gopinathan (Vice Chancellor Digital University)

Digital Enablement of HEIs in Kerala

Implementation of Learning Management System

This plan is in response to the call of the Government to Go Digital in teaching/learning in higher education at the earliest. The plan is to establish Moodle Learning Management System (LMS) in all the higher education institutions in the state, especially colleges and universities, in 100 days. We propose implementation of a centralised model, resource-frugal, easier, quicker, and less expensive.

Executive Summary

This model is based on the technology of Virtual Machines Docker Containers System (VMDCS), which requires minimum number of actual machines. It can provide every university and college its own Moodle portal giving access to all students and faculty to use them to supplement their teaching and learning.

The Digital University will set up the centralised cloud space for KSHEC in SDC for all higher education institutions in the state, providing each college/university its own dash board to manage its activities through LMS. As per our proposal the Digital University will set up a centralised cloud space for KSHEC in SDC and create instances for universities and colleges. Individual faculty will have the privilege to manage his or her courses in the system.

Each college will be in a docker container and the number of containers in operation will depend upon the number of colleges using the solution simultaneously. We will put multiple colleges in a docker, since the architecture demands such optimisation depending on the load. In this case every college will be using the same process (Moodle). The only difference is that all colleges may not be accessing it simultaneously.

Continual updation of courses and programs will be done by the university or the college concerned. The Basic IT skill is enough for the faculty to perform this. However, teachers require training to use the LMS.

KSHEC and the Digital University will jointly conduct trainers training programmes for reaching the skill to all the faculty members. KSHEC has already trained about 2000 teachers under FDP. Now over 300 teachers are undergoing trainers training organised by KSHEC. Simultaneously the Digital university will soon start trainers training workshops for the faculty members.

Another step is stakeholders meet and formation of working group groups of teachers and students. Some eighty groups are being formed for field action by teachers and students ensuring institutional preparedness.

Microservices and Containers System, the most advanced, helps effective centralisation essential for system administration as well as quality assurance. But the architecture of LMS (Moodle) does not allow the implementation of a part of the solution as sub processes. Hence it is proposed that the docker containers are used for hosting college instances.

If Moodle had given provision for splitting of services like quizzes, assignments, exams, classes, interactions etc., then micro service architecture could have been a good option. In the current case, load balancing, by looking at the demand variation across the colleges, the docker container architecture at the college level may be the best solution.

Government Sanction Required

As we have estimated, we will have to cater to the needs of around 360000 users at its full-blown phase. Immediately we will have to meet the requirements of 200 institutions and be prepared for serving at least 300 institutions in two years. Keeping these in mind we require the server space from the State Data Centre (SDC) for the following:

a) For onboarding 300 colleges to Moodle, we may require around 15 Numbers of Application servers (each with 192GB Memory & 300 GB storage), 5 Numbers of database servers (each with 384 GB memory and 500 GB storage), and 2 Load balancers with 8GB memory and 300 GB storage.

b) Additionally we require Network File System Storage of around 5 TB (we plan to keep videos in YouTube channel with restrictive access to supplement this)

Resource Requirement

The requirement at each level for the centralised solution is proposed below:

	Level	**Activities**	**Resources Required**	**Remarks**
1	Student Level	Access and use the LMS	Network Connectivity Access device (mobile, tab, laptop or desktop)	Can be provided at student level (own/ gifted) or at a college level or at a public institution level to access the LMS
2	Faculty Level	Create the courses, Develop/source blended learning objects, manage the classes, evaluation	Network connectivity, access device (laptop/desktop is preferable. Mobile phones are also ok)	Needs to be procured by faculty themselves or a scheme may be devised to provide the same
3	Institutional Level	Setting up College Moodle, Routine administration, course and faculty management, trouble shooting	Network connectivity Desktop/ Laptop of reasonably good configuration	Can be procured by the college or could use one of the existing machines in the college

4	Cloud level	Creation of instances for each college. Clustering and configuring Virtual Machines. Providing handholding support to individual colleges. Help desk facility to take care of queries and concerns	Centralised cloud availability (from SDC or public clouds) depending upon the features provided, the size of the space required can be estimated. Some indications are given in annexure Technical resource to create the instances for each college Help desk personnel	Digital University will take up this responsibility. Some augmentation of its manpower is required. The exact requirement can be informed after assessing the number of colleges and time frame. It may be limited to one or two dedicated technical resources and a helpdesk

Way Forward

The following way forward with approximate time lines

Sl No	Activity	Time line	Responsibility
1	Finalisation of the Model after stakeholder discussions. (commencement of work) – including scoping the problem and approval of implementation plan and resources thereof	30 days	KSHEC
2	Creating the centralised infrastructure, creating college instances, testing and roll out	30 days	Digital University

3	Individual college level LMS implementation, review and final state wide roll out	30 days	Digital University along with KSHEC and Higher Education Dept., participating colleges
4	Training of faculty members – offline and online training	100-150 days (done in parallel after setup above)	Digital University in collaboration with KSHEC (may require support from other Institutions depending on the time, number of Institutions & teachers and level of training required)

Institutional Training Programme

Let's Go Digital Campaign

Moodle-Learning Management System

CURRENT SCENARIO

Under the banner of *Let's Go Digital* campaign of the state government for the digital enablement of higher education institutions the Faculty Development Centre (FDC) of the Kerala State Higher Education council in association with the Digital University of Kerala has been entrusted to conduct Institution Level Training (ILT) for the entire faculty of Universities & Colleges in the state. ILTs organised in clustered manner was officially launched by the hon'ble minister for Higher Education Dr. R. Bindu on 22-9-2021, could offer training for 35 institutions so far. It is envisaged that those colleges have completed the training will eventually be provided server space at Digital University of Kerala in the first phase so as to enable to run their MOODLE-LMS on this platform. *Let's Go Digital* campaign aims to cover 1500+ institutions and all universities in the state so that the LMS MOODLE based teaching learning activities can be successfully implemented, which ultimately provide the techno-driven space for blending learning

The server space at the centralized cloud space of Digital University of Kerala based on the technology of Virtual Machines Docker Containers System (VMDCS), requires only minimum number of actual machines providing each college/university its own dash board to manage its activities through LMS. It can provide each university and college its own Moodle portal giving access to all students and faculty to use them to supplement their teaching and learning. FDC of the council is actively organizing training programme on MOODLE-LMS meeting the long-term objective of completing the training and implementation of LMS in entire HEIs in the state.

Brief Outline of Trainings

As part of the digital enablement drive, the FDC of the council has been engaged in MOODLE based Faculty Development Programme (FDP) training for faculty members since July 2020 when the offline teaching activity got disrupted due to Covid-19 pandemic. Afterwards in 2021, the *Let's Go Digital* initiative launched in association with Digital University of Kerala a series of training programmes as short-term FDP has been organised.

The following is the brief account of the above category of training held since July 2020 are listed below:

No	Training details	Participants attended	Date and Duration
1	FDP -KSHEC in Online Education in HEI's (For Science Discipline) Resource Persons: Prof. N.J. Rao, IISc Bangalore Prof. C. Chandrashekhar, IIIT Bangalore Dr. K. Rajani Kanth, Bangalore	Faculty members in Science discipline from universities and colleges (<10 years in teaching service) Venue: Online Webex Platform No. of Participants: 291	13-7-2020 To 17-7-2020
2	FDP -KSHEC-in Online Education in HEI's (For Arts and Humanities Discipline) Resource Persons: Prof. N.J. Rao, IISc Bangalore Prof. C. Chandrashekhar, IIIT Bangalore Dr. K. Rajani Kanth, Bangalore	Faculty members in Arts and Humanities discipline from universities and colleges (<10 years in teaching service) Venue: Online Webex Platform No. of Participants: 286	3-8-2020 To 7-8-2020
3	FDP -KSHEC in LMS and Course Design (For all Disciplines) Resource Persons: Dr. Lajish, Calicut University, Dr. Ashkarali, Gov.t College Tanur Dr. Ramesh A.V., Govt. Victoria College, Palakkad	Faculty members from various colleges affiliated with the state universities Venue: Online No. of Participants: 100	19-10-2020 to 23-10-2020
4	FDP-KSHEC in LMS and Course Design (For all Disciplines) Resource Persons: Dr. Lajish, Calicut University, Dr. Ashkarali, Gov.t College Tanur Dr. Ramesh A.V., Govt. Victoria College, Palakkad	Faculty members from various colleges affiliated with the state universities Venue: Online No. of Participants: 100	30-11-2020 to 03-12-2020
5	FDP in Edu-Tech Hands-On Training-KSHEC (Moodle-LMS) (For all Disciplines) Resource Persons: Dr. Ashkarali, Gov.t College Tanur Dr. Ramesh A.V., Govt. Victoria College, Palakkad Dr. Biju K., Central University of Kerala Dr. Santhosh H.K., Govt. Sanskrit College, Pattambi	Faculty members from various colleges affiliated with the state universities Venue: Online -Webex No. of Participants: 192	23-06-2021 to 28-06-2021
6	FDP in Trainers Training Programme-KSHEC (Moodle-LMS) (For all Disciplines) Resource Persons: Dr. Binu Thomas, Marian College, Kuttikkanam Dr. Mendus Jacob, Marian College Kuttikkanam	Faculty members from various colleges affiliated with the state universities Venue: Online -Webex No. of Participants: 290	08-07-2021 to 14-07-2021
7	Let's Go Digital -KSHEC-Moodle Trainers Team (MTT) @ Kerala State Higher Education Council The same will be conducted in association with KSHEC at CET Trivandrum	Participants: selected faculty from CET and arts and science colleges (handpicked) who have already	22-07-2021 to 27-07-2021

	Dr. Sumesh Divakaran & working group members as resource persons. Training Centre: CET Trivandrum	acquired adequate basic knowledge on MOODLE tools No. of Participants:115	(3.00 pm to 5.00pm)
8	Lets Go Digital – KSHEC-FDP on Learning Management Systems conducted by the KSHEC KSHEC in association with the Department of Computer Science, University of Calicut. Organised Dr. Lajish V. L., Assistant Professor & Head, Department of Computer Science, University of Calicut & existing working group members as resource persons. Training Centre: KSHEC	Participants: faculty from state universities and affiliated colleges who needs basic training on MOODLE tools Duration of sessions: 10.00 am to 4.00pm Venue: Online No. of Participants: 130	26-7-2021 to 30-7-2021
9	Lets Go Digital - KSHEC-Using Moodle as a Learning Management System - Training for CET faculty In association with KSHEC at CET Trivandrum Resource Persons& Organised by Dr. Sumesh Divakaran & existing working group members as resource persons. Training Centre: College of Engineering Trivandrum	Participants: faculty from CET alone, who have already acquired adequate basic knowledge on MOODLE tools No. of Participants: 250	29-07-2021 to 03-08-2021 3.00 pm to 5.00pm
10	Lets Go Digital -KSHEC-Using Moodle as a Learning Management System - Training for the faculty of Govt. Brennen College, Thalasserry In association with KSHEC at CET Trivandrum Resource Persons & Organised by: Dr. Dileep R. & existing working group members as resource persons. Training Centre: Govt. Brennen College, Thalasserry	Participants: faculty from Govt. Brennen College, Thalasserry No. of Participants: 130	05-8-2021 to 10-8-2021 5.00-7.00pm
11	Lets Go Digital – KSHEC-FDP on Learning Management System (Moodle) and Course Designing In association with the Department of Computer Science, University of Calicut. Resource Persons: Dr. Lajish V. L., Assistant Professor & Head, Department of Computer Science, University of Calicut & existing working group members as resource persons. Training Centre: KSHEC	Participants: faculty from state universities and affiliated colleges who needs basic training on MOODLE tools No. of Participants: 175	09-8-2021 to 13-8-2021 10.00 am to 4.00pm
12	Lets Go Digital – KSHEC-FDP on Learning Management System (Moodle) and Course Designing (Batch 1) Conducted by KSHEC: Existing working group members and those from resource pool will be the resource persons. Training Centre: KSHEC	Participants: faculty from state universities and affiliated colleges who needs basic training on MOODLE tools No. of Participants: 175 (Proposed as 2 batches parallelly)	01-9-2021 to 06-9-2021 10.00 am to 4.00pm
13	Lets Go Digital – KSHEC-FDP on Learning Management System (Moodle) and Course Designing (Batch 2) Conducted by KSHEC:	Participants: faculty from state universities and affiliated colleges who needs basic training on MOODLE tools No. of Participants: 175	01-9-2021 to 06-9-2021 10.00 am to 4.00pm

	Existing working group members and those from resource pool will be the resource persons. Training Centre: KSHEC		

14	Let's Go Digital – KSHEC- LMS- (Moodle)- Institution Level Training Coordination by Dr. Santhosh H.K., and Team	Institutions from Idukki, Kottayam, Pathanamthitta districts & Govt. College, Tirur No. of Participants:	14-9-2021 to 18-9-2021 5.00 pm to 7.00pm
15	Let's Go Digital – KSHEC- LMS- (Moodle)- Institution Level Training Coordination by Dr. Lajish V.L. and Team	Institutions from Malappuram, Kozhikode & Palakkad districts No. of Participants:	13-9-2021 to 17-9-2021 3.00 pm to 7.00pm
16	Let's Go Digital – KSHEC- LMS- (Moodle)- Institution Level Training Coordination by Dr. Mendez Jacob and Team, Marian College Kuttikkanam	Institutions from Thiruvananthapuram, Kollam districts No. of Participants:	22-9-2021 to 27-9-2021 5.00 pm to 7.00pm
17	Let's Go Digital – KSHEC- LMS- (Moodle)- Institution Level Training (One week) 5 days online Coordination by Dr. Mendez Jacob and Team	Institutions from various places No. of Participants:380	11-17th May 2022 5.00 pm to 7.00pm
18	Let's Go Digital – KSHEC- LMS- (Moodle)- Institution Level Training (One week) 5 days online Coordination by Dr. Santhosh H.K. and Team	Institutions from various places No. of Participants:429	11-17th May 2022 5.00 pm to 7.00pm
19	Let's Go Digital – KSHEC- LMS- (Moodle)- Institution Level Training (One week) 5 days online Coordination by Dr. Lajish V.L., University of Calicut and Team	Institutions from various places No. of Participants:100	15-21st July 2022 3.00 pm to 5.00pm
20	Let's Go Digital – KSHEC- LMS- (Moodle)- Institution Level Training (One week) 5 days online Coordination by Dr. Mendez Jacob, and Team, Marian College Kuttikkanam	Institutions from various places No. of Participants:100	22-28th Sep 2022 5.00 pm to 7.00pm
21	Let's Go Digital – KSHEC- LMS- (Moodle)- Institution Level Training (One week) 5 days online Coordination by Dr. Santhosh H.K. and team, SNGS, Pattambi	Institutions from various places No. of Participants:100	22-28th Sep 2022 5.00 pm to 7.00pm

The list of cluster level ILTs held during this period is listed in the table below, which was oraganised under three clusters so far. The remaining institutions will be clustered accordingly for convenient & effective administration of training.

It is worth noting that, Under the banner of Let's Go Digital, so far, a total of 3600 teachers as on August 2022 for obtaining proficiency in MOODLE-LMS.

No	Type of Training	No. of training held	Total faculty trained
	No. of FDP training held for MOODLE-Learning Management System	11	2351
	No. of Institution wise training held (CLUSTER I to VII)	3	1307
		Total	3658

A detailed account of the institutional training including the list of institutions covered are provided below.

Institutional Training Part-1
(INDEPENDENT)

No	College	District	Type	Category
1	College of Engineering Trivandrum (CET)	Trivandrum	Government	Engineering
2	Government Brennen College, Thalassery	Kannur	Government	Arts and Science

Institutional Training Part-2
(CLUSTERS)
Cluster I
13 to 17 September 2021
Kozhikode, Malappuram & Palakkad districts

No	College	District	Type	Category
1	Govt. Engineering College, Kozhikode	Kozhikode	Government	Engineering
2	Thunchath Ezhuthachan Malayalam University	Malappuram	University	Arts and Science
3	EMEA College of Arts and Science, Kondotti	Malappuram	Aided	Arts and Science
4	College of Applied Science, Vadakkencherry	Palakkad	Government	Arts and Science
5	Government College, Chittoor	Palakkad	Government	Arts and Science
6	PTM Government College, Perinthalmanna	Malappuram	Government	Arts and Science
7	Government Victoria College, Palakkad	Palakkad	Government	Arts and Science

Cluster II
14 to 18 September 2021
Idukki, Kottayam & Pathanamthitta districts

No	College	District		
1	NSS College, Rajakumari	Idukki	Aided	Arts and Science
2	CAS, (IHRD) Anchunadu, Kanthalloor	Idukki	Government	Arts and Science
3	CAS, (IHRD), Muttom, Thodupuzha	Idukki	Government	Arts and Science
4	Government College, Kattappana	Idukki	Government	Arts and Science
5	CAS, (IHRD), Nedumkandam	Idukki	Government	Arts and Science
6	CAS, (IHRD), Puthuppally, Payyappady	Kottayam	Government	Arts and Science

7	CAS, (IHRD), Kanjirappally	Kottayam	Government	Arts and Science
8	CAS, (IHRD),Kaduthuruthy,Neezhur	Kottayam	Government	Arts and Science
9	CAS, (IHRD), Mallappally	Pathanamthitta	Government	Arts and Science
10	CAS, (IHRD),Ayroor	Pathanamthitta	Government	Arts and Science
11	St. Thomas College, Kozhencherry	Pathanamthitta	Aided	Arts and Science
12	Thunchan Memorial Govt. College, Tirur	Malappuram	Government	Arts and Science

Cluster III
22 to 27 September 2021
Thiruvananthapuram & Kollam districts

No	College	District		
1	CAS, (IHRD), Kundara	Kollam	Government	Arts and Science
2	NSS College for Women, Neeramankara	Tvpm	Aided	Arts and Science
3	Govt Arts and Science College, Kulathoor	Tvpm	Government	Arts and Science
4	Govt.College Thalassery Chokli	Kannur	Government	Arts and Science
5	Maharaja's College, Ernakulam	Ernakulam	Government	Arts and Science
6	TKM College of Arts & Science Kollam	Kollam	Aided	Arts and Science
7	Government College, Attingal	Tvpm	Government	Arts and Science
8	Gregorian College of Advanced Studies, TVM	Tvpm	Self Fin	Arts and Science
9	College of Applied Science Kodungallur	Thrissur	Government	Arts and Science
10	St. Mary's College, Sulthan Bathery	Waynad	Aided	Arts and Science
11	KMM Govt. Women's College, Kannur	Kannur	Government	Arts and Science
12	Sa-adiya Arts and Science College, Kasaragod	Kasaragod	Self -Fin	Arts and Science
13	St. Stephen's College, Pathanapuram	Pathanamthitta	Aided	Arts and Science
14	Government Sanskrit College, TVM	Tvpm	Government	Sanskrit
15	Government Arts College, TVM	Tvpm	Government	Arts and Science

Hence by the end of the ongoing Cluster III training, 37 institutions/colleges including one university would become fully training with their entire faculty members for MOODLE LMS implementation.

Resource Groups handling Training

No	College
1	Dr. Santhosh H.K. & team (College Learning Centre, SNGS Pattambi)
2	Dr. Lajish V. Calicut University & team
3	Dr. Mendez Jacob & team, Marian College Kuttikkanam

The LMS MOODLE Training Status and Digicol Sever Allotment as on 13th July 2022

Institutional Training-Status				
Clusters	**Training Held**	**Resource Persons**	**Colleges**	**Teachers trained**
Cluster I	13-17 Sep 2021	Dr. Lajish V.L. & Team	9	437
Cluster II	14-18 Sep 2021	Dr. Santhosh HK. & Team	14	332
Cluster III	22-27 Sep 2021	Dr. Mendez Jacob & Team	14	689
Cluster IV	11-17 May 2022	Dr. Mendez Jacob & Team	9	380
Cluster V	23-28 June 2022	Dr. Santhosh HK. & Team	7	429
Cluster VI	15-21 July 2022	Dr. Lajish V.L. & Team	12	442
Cluster VII	21-28 Sep 2022	Dr. Mendez Jacob & Team	12	442
Cluster VII	~~21-28 Sep 2022~~	~~Dr. Mendez Jacob & Team~~	~~12~~	~~442~~
Special batch-CET, Trivandrum	29 July onwards 21	Dr. Sumesh Divakaran & Team	**1**	**300**
Special batch -Brennen College	5-10 Sep 2021	Dr. Santhosh HK. & Team	**1**	**170**
Total Trained			**55**	**2737**
Trainers Training (MTT)	22-27 July 2021	Dr. Sumesh Divakaran & Team	**Selected faculty**	**120**

Pending for training as on 22-6-22	27

	Digicol enrolled	**Pending to enrol**		
	20	34		
Next Training				
Cluster VI (Scheduled to be conducted)	15-21 July 2022	Dr. Lajish V.L. & Team	12	442

The list of colleges that have been added into the Digicol platform are as below.

1. Govt Brennan College, Thalassery
2. Maharajas College, Ernakulam
3. Victoria College, Palakkad
4. Thunchath Memorial Govt College, Tirur
5. Krishna Menon Memorial Govt Womens College, Kannur
6. St Mary's College, Sulthan Bathery
7. N. S. S College, Rajakumari
8. TKM College of Arts and Science, Kollam
9. Govt Arts and Science College, Neyattinkara
10. St Thomas College, Kozhanchery
11. Government Arts College, Thiruvananthapuram
12. Government College, Kattappana
13. Government College, Malappuram
14. PTM Govt. College, Perinthalmanna
15. College of applied Science, Kodungallur
16. College of applied Science, Ayroor
17. College of applied Science, Kanjirappally
18. College of applied Science, Thodupuzha
19. College of applied Science, Marayoor
20. College of applied Science, Kaduthuruthy

As per the information from Digital University,
DUK has shifted all the services of Digicol to a new server as per the architecture that was proposed earlier.
The new server setup includes

- Two application servers which can host maximum 30 colleges
- Two MySQL Clusters that can handle up to 4000 concurrent sessions in each cluster
- One NFS Server for data storage

Implementation of LMS in Higher Education Institutions

Annual Action Plan & Expenditure requirement

Part I

Executive Summary

The Digital Enablement of Higher Education Institutions is plan in response to the call of the Government to Go Digital in teaching/learning in higher education at the earliest. The plan is to establish Moodle Learning Management System (LMS) in all the higher education institutions in the state, especially colleges and universities, in 100 days. The Kerala State Higher Education Council then proposed implementation of a centralised model, resource-frugal, easier, quicker, and less expensive.

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This model is based on the technology of Virtual Machines Docker Containers System (VMDCS), which requires minimum number of actual machines. It can provide every university and college its own Moodle portal giving access to all students and faculty to use them to supplement their teaching and learning.

As per the proposal the **Digital University will set up a centralised cloud** space for KSHEC in SDC and create instances for universities and colleges providing **each college/university its own dash board to manage its activities through LMS**. Individual faculty will have the privilege to manage his or her courses in the system.

Each college will be in a docker container and the number of containers in operation will depend upon the number of colleges using the solution simultaneously. We will put multiple colleges in a docker, since the architecture demands such optimisation depending on the load. In this case every college will be using the same process

(MOODLE). The only difference is that all colleges may not be accessing it simultaneously.

Continual updation of courses and programs will be done by the university or the college concerned. The Basic IT skill is enough for the faculty to perform this. **However, teachers require training to use the LMS.**

KSHEC and the Digital University will jointly conduct trainers training programmes for reaching the skill to all the faculty members. Faculty Development Centre of KSHEC has already trained about 3600+ teachers under Faculty Development Programme (FDP). It also have completed institution level training as clusters for 35 colleges in the state providing training for the entire faculty of these institutions together. It is important to note that the state has HEI population of 1500+ institutions belonging to comprised of Government, Aided and Self-financing nature. Simultaneously the Council & DUK with the support of lead institutions and resource group organises trainers training workshops for the faculty members.

To facilitate these steps of action, working group of teachers with LMS proficiency have been formed for field action by teachers and students ensuring institutional preparedness for this initiative.

Progress Achieved

As the Faculty Development Centre (FDC) of the Kerala State Higher Education council has been entrusted to organise & provide conduct Institution Level Training (ILT) for the entire faculty of Universities & Colleges in the state, the council has launched this training in cluster mode involving 10-15 colleges in each training. The institution level training was officially launched by the hon'ble minister for Higher Education Dr. R. Bindu on 22-9-2021. Training for 35 institutions have been completed so far. Since those colleges have completed the training will eventually be provided

server space at Digital University of Kerala, colleges have been asked to provide details of two faculty members designated for LMS programme management at their institution.

FDC of the council had initiated MOODLE based LMS as a main theme for its Faculty Development Programme (FDP) since July 2020 when the offline teaching activity got disrupted due to Covid-19 pandemic. Afterwards in 2021, the *Let's Go Digital* initiative launched in association with Digital University of Kerala a series of training programmes as short-term FDP has been organised.

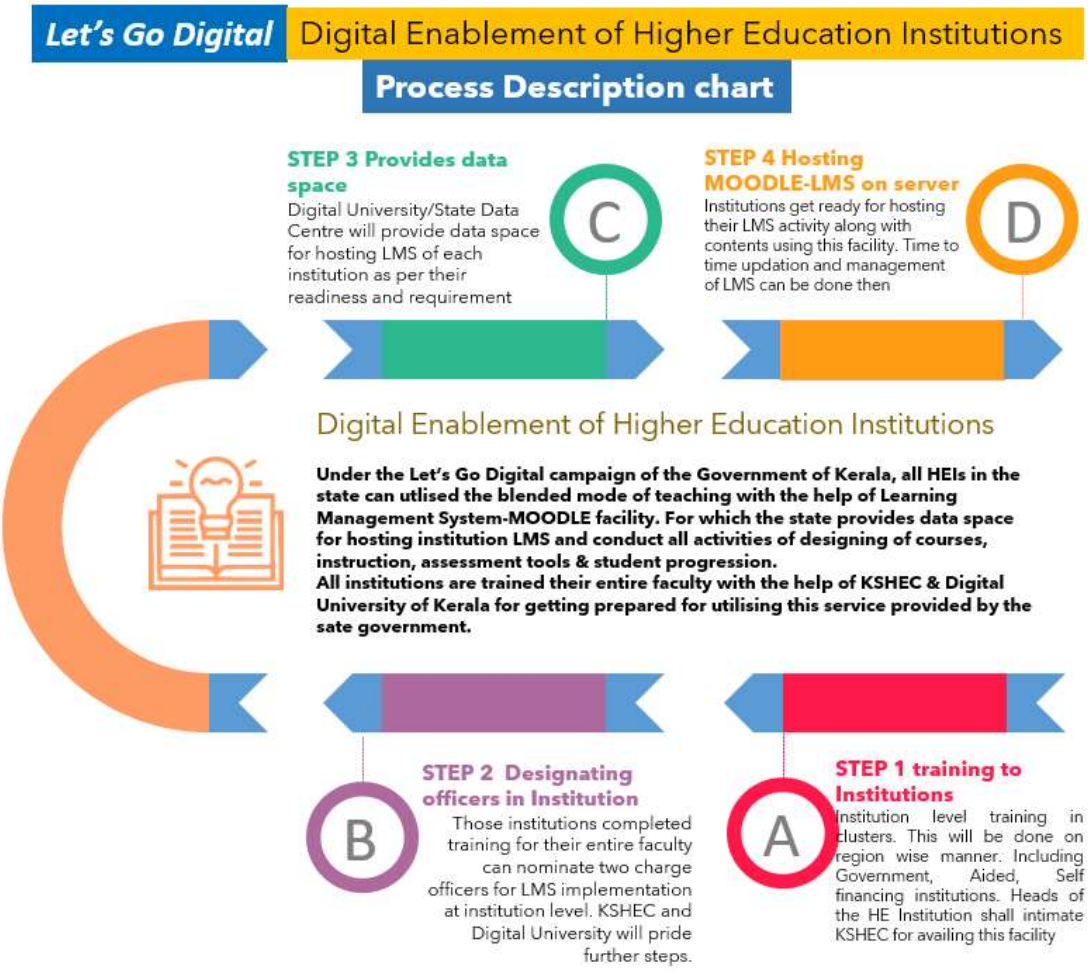
A brief account of the above category of trainings held since July 2020 are listed in *Appendix Table 1.*

A list of cluster level ILTs held during this period is listed in *Appendix Table 2.*, which was oraganised under three clusters so far. Institutions will be clustered accordingly for convenient & effective administration of training programmes.

It is worth noting that, Under the banner of Let's Go Digital, so far a total of 3600 teachers (including the ongoing training which started today on 22-9-21) for obtaining proficiency in MOODLE-LMS.

No	Type of Training	No. of training held	Total faculty trained
	No. of FDP training held for MOODLE-Learning Management System	11	2351
	No. of Institution wise training held (CLUSTER I,II,III)	3	1307
		Total	3658

In addition to the above, a detailed account of the institutional training including the list of institutions covered are provided in Appendix Table 3, 4, 5 & 6 for institutions independently and as clusters. The list of groups leads by resource persons *(Appendix Table 7)* to be handled these training programmes include the faculty from different HEIs in the state and the council is building such groups of experts for handling the training in the future. Appendix Table 8 shows the district level participation of institutions for



this training.

Currently many more institutions from various districts have expressed their willingness to avail the training facility under this scheme and also to involve in the digital

enablement drive of the government in availing the server facility for installing MOODLE-LMS platform for their institutional use.

Proposed Activities & Financial Component

As per the latest data of the KSHEC and AISHE, the total number of HE institutions in the state is 1560 and 14 universities. Considering the demand for meeting the objective of enabling all institutions in the state to manage their own LMS and teaching learning activity. The roadmap of activities by the KSHEC for Digital Enablement drive is therefore one of the principal components of plan proposal of KSHEC for the eyar 2022-23.

The detailed expenditure for setting up the infrastructure at DUK is annexed as Part II.

KSHEC: The institutional and admin cum trainer's training for the faculty for the implementation of the project in a fruitful manner, requires consistent approach. The progress gained by the council so far in this aspect has to be kept running and speeded up now.

No	College	No. of Cluster level Training	Expenditure
1	Organizing Training to Institutions	36	75 lakhs
2	Trainers Training/Admin Training	12	25 lakhs
	Total	48	100 lakhs

(NB: Training for these 100 institutions can be done phase to phase manner in various clusters. Each cluster may contain 10-15 colleges as per the faculty strength. In some instances, this would go up to 20 institutions. The tentative no. of training and expenditure is for ideal capacity and remuneration for resource persons)

DUK: The approximate expenditure for the proposed central server hosting architecture developed and data center built by the Digital University of Kerala (DUK) is given below. This amount has been proposed by DUK as an estimate for 500 colleges for the year 2022-21.

Sl No	Item	Nature of Cost	Approximate Amount	Source	Remarks
1	Basic Hosting infrastructure	One time	Not budgeted as it will be provided free by DUK in its Data center	DUK	
2	Serve Infrastructure including storage	One time	Rs 900,00,000 (approximate)	KSHEC based on actuals	This will suffice for 500 colleges
3	Manpower & Support cost	Recurring	Rs 20,00,000 for 2022-23	KSHEC	
4	Annual Communication Expenditure	Recurring	Rs 80,00,000 (approximate) for 2022-23	KSHEC based on actuals	
	TOTAL		Rs10, 00,00,000	KSHEC	

	Role Institution	Nature of expense	Amount	Component
	DUK	One time + Recurring	Rs10, crores	Infrastructure Development & Maintenance
	KSHEC	One time + Recurring	Rs.1 crore	Training Purpose
		Total	Rs.11 crores	

Part II

Proposal of Setting up Server Infrastructure For

DIGITAL ENABLEMENT IN HIGHER EDUCATION: IMPLEMENTATION OF LEARNING MANAGEMENT SYSTEM (LMS) IN HIGHER EDUCATION INSTITUTIONS

Submitted to

Kerala State Higher Education Council

DIGITAL UNIVERSITY KERALA
Curating a responsible digital world

KERALA UNIVERSITY OF DIGITAL SCIENCES, INNOVATION AND TECHNOLOGY

Introduction

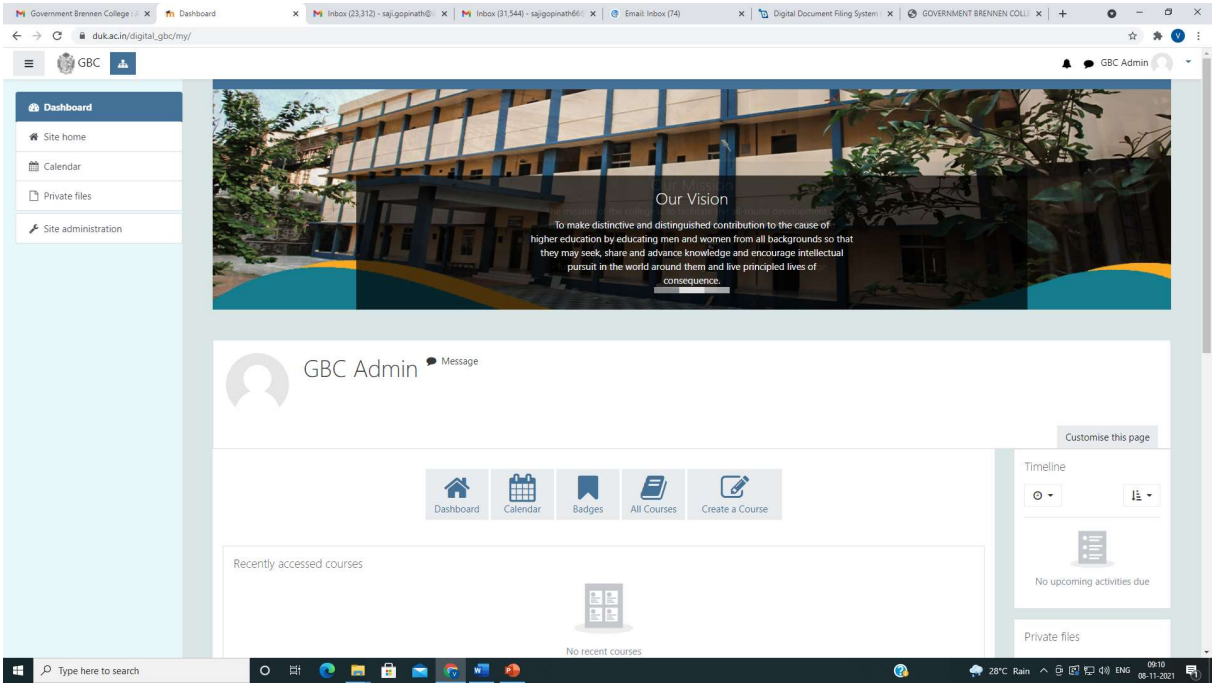
As a part of its initiative to digitally enable all the Higher Education Institutions in the State, Kerala State Higher Education Council has initiated a project to equip all colleges with a Digital Learning Management System (LMS), which could supplement the classroom education. Council had conducted extensive training of faculty of various colleges on the use of LMS during the last few months. Kerala University of Digital Sciences, Innovation and Technology (Digital University) is collaborating with KSHEC in this noble initiative. The open-source platform Moodle is selected as the Learning Management System and Digital University is providing backend technical support for implementing the software. A detailed proposal to roll out the LMS in 300 colleges is already submitted to Government (Annexure-1) under the Let's GO Digital project. Even though Colleges have resumed offline classes, it is necessary to continue with the project, as LMS is an integral part of the blended learning being implemented in various institutions of higher learning

The Learning Management System is planned to be implanted with a centralized hosting architecture to optimize the usage and to reduce the cost of operations. While a few colleges may opt for their own cloud /serve space, and few others may be linked with high performance server space available in a few Universities, majority of the colleges require a centralized hosting architecture to ensure seamless and continuous operation of Moodle. It is proposed that KSHEC procure such a centralized architecture and DUK will take care of all the technical/hosting/maintenance matters, including updates and maintenance of servers. In order to reduce the cost of operation, the proposed server of KSHEC will be maintained within the Data centre being built in the DUK campus. This proposal gives the details of the project

Model of Implementation

A centralized model of hosting of the solution is proposed for the colleges coming under this scheme. In this model, DUK will create separate instances for each college at a central server and colleges can access the same through their networks or access devices at

individual level. Each college will have a customized (basic level of customization like name, logo, type of courses etc.) portal of their own. A competent person from among the college faculty can be entrusted to manage the system. Central management and system administration can be done by KSHEC with the help of Digital University. A pilot project is successfully implemented in Government Brennan College Thalassery in September 2021 and is being used widely by students and faculty members



A Model LMS implemented in Government Brennan College Thalasserry

The project is expected to be scaled to all colleges in Kerala within next 8-10 months. Even though public cloud provides high level of elasticity to demand, given the high hosting charges and lack of available space in SDC, it is proposed that DUK will setup a dedicated Server Infrastructure in DUK Data Centre and will host Moodle instances for various colleges.

Resource/Server Requirements

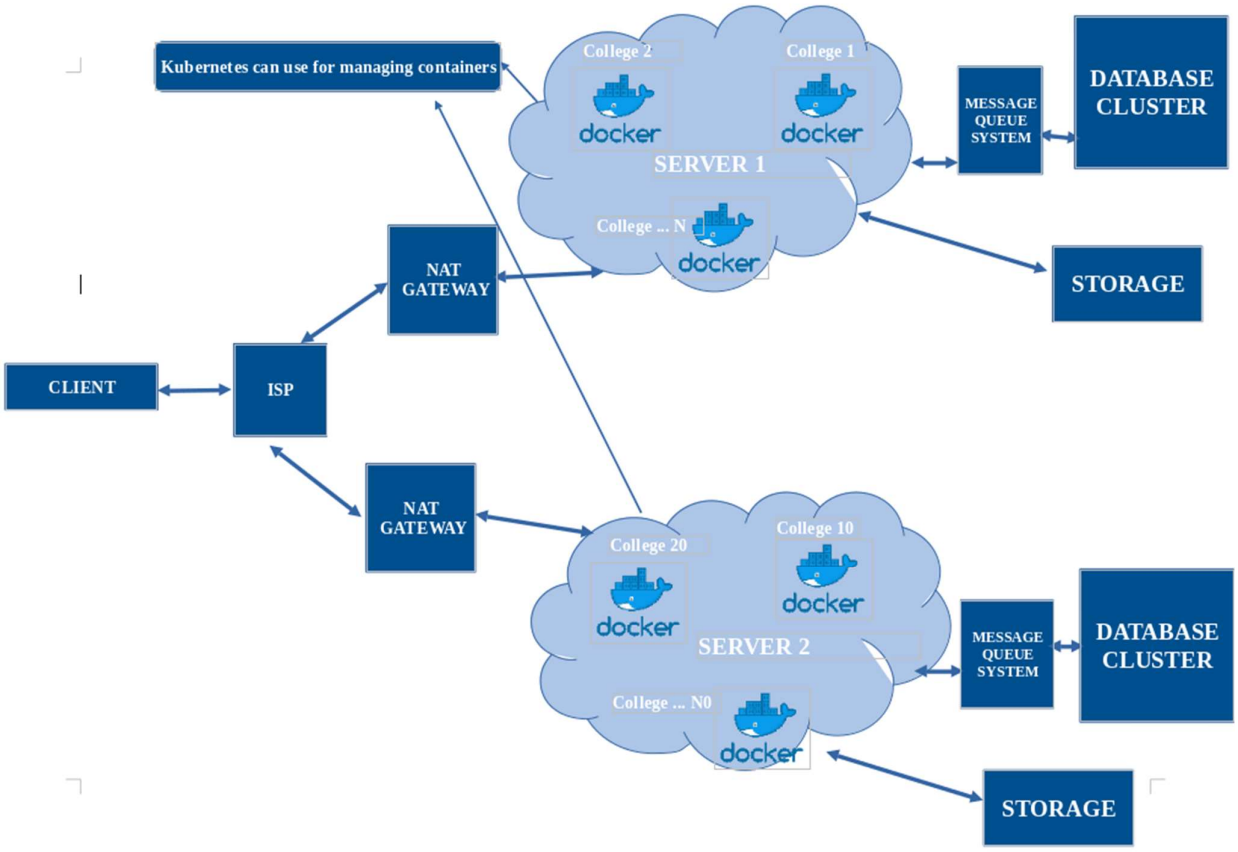
It is proposed that a central server hosting architecture is developed which will be placed in the data centre being built in Digital University. The basic infrastructure facilities like physical temperature-controlled space, security and authentication facilities, power back up etc, will be

provided by DUK in the datacenter being built in DUK campus. Kerala State Higher Education Council can provide the server infrastructure, specifications of which is given below, which will be managed in the DUK data centre. The server will be dedicated for the purposes of KSHEC and the individual colleges will be given access to virtual containers being built within this server. The central hosting infrastructure with high availability would ensure 24x7 access to LMS to all students and faculty

The requirements of the hosting architecture required for 500 colleges with 300000 students is given below.

	Server Infrastructure required
1	Server Infrastructure with Virtualization Environment - Processors with latest generation processor -Total Usable cores should be 2500 cores for the setup - Total usable RAM should be 5 TB with latest technologies (DDR4 or above) - Usable Storage space of 125 TB -Virtualization Software with unlimited VM -Backup Software with Back up Appliance
2	Man Power for Central Management. (2 numbers)
3	Communication Charges (high speed bandwidth for seamless access)

Proposed Hosting Architecture



Budget Requirement

The budget requirement of the project involves three components, namely the infrastructure cost for basic facilities, infrastructure cost for server space and manpower cost for management. The approximate cost for 2022-23 is given below

Sl No	Item	Nature of Cost	Approximate Amount	Source	Remarks
1	Basic Hosting infrastructure	One time	Not budgeted as it will be provided free by DUK in its Data center	DUK	
2	Serve Infrastructure including storage	One time	Rs 900,00,000 (approximate)	KSHEC based on actuals	This will suffice for 500 colleges
3	Manpower & Support cost	Recurring	Rs 20,00,000 for 2022-23	KSHEC	
4	Annual Communication Expenditure	Recurring	Rs 80,00,000 (approximate) for 2022-23	KSHEC based on actuals	
	TOTAL		Rs10, 00,00,000	KSHEC	

It is important to note that DUK will provide the basic infrastructure including weather-controlled hosting infrastructure, load balancers, firewall, security architecture etc. in its data centre. KSHEC shall procure the server as per specifications which will be configured and managed by DUK. Two full time employees on contract with at least 5 years of experience in managing data centres is proposed to manage this infrastructure. There is also a need to have dedicated communication infrastructure. The annual cost of communication (depends on extent of use) is estimated to be Rs 80 lakhs.

As per the proposal, there is an one time cost of Rs 9 Crores[1] and a recurring cost of around 1 Cr per year. This will work out to be around 2 lakh per college as one time expense and an annual expense of around Rs 20,000. It is pertinent to note that, if external cloud solutions are adopted the annual cost per college will work out to be around Rs 3-5 lakhs depending on

[1] This is estimated for around 500 colleges. This can be set up in a modular fashion based on actual demand

the usage. Further such a solution will necessitate the storage in third-party facilities which may have data security issues. In view of the above, the current proposal provides substantive cost advantages as well as data security.

Closure

As a part of implementing Let's GO DIGITAL project for enabling Higher Education Institutions for developing and using digital content, KSHEC along with Digital University has worked out a scheme for implementing Moodle LMS in all colleges in the State. A centralized architecture under KSHEC is proposed as the backend infrastructure for the project. This proposal gives details of such a back end infrastructure. It is proposed that the basic infrastructure will be provided by DUK in its data centre while server cost and recurring cost of management and communication will be borne by KSHEC. An one time cost of Rs 10 cores is proposed for 2022-23. The annual cost for subsequent years will be around Rs 1 Crore. This infrastructure will be sufficient t support at least 500 HEIs in the State.

Hindrances of Computerisation at the University Level

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Today Organizations are globally facing a period of rapid computerization of almost all functions. Moreover, the environment of organizations is changing because of the new strategic possibilities of Information Technology. Computerized information systems are thus affecting organizational structure at multiple levels: they change the internal division of labour and the mechanisms of coordination, and they affect the strategies of the enterprise. Relative effects of these changes can leave the organization transitioning towards a new “strategy structure” configuration.

The higher education sector across the world is going through drastic changes as a result of ICT implementation. Computerization and information technology (IT) implementation have enriched the teaching, learning, and evaluation process at various levels in higher education. This brief report is a rapid appraisal of the present condition of IT infrastructure, its operation and difficulties. While the admission module is satisfactorily in place, the other aspects are facing difficulties. Hence the focus here is on the practical hindrances prevalent in the academic and examination modules, deflecting the computerization initiatives.

Every Academic institution should provide information about its basic characteristics, clearly communicate the educational mission, and describe the strategies for achieving educational goals and their effectiveness within a specific time frame. Both applicants enrolled students, and the general public, at large, among others, need to understand the educational mission and goals as well as how broadly and deeply students are learning with respect to them. Hence, computerization is an integral solution on campus as it is the most important source of automation of processes and process improvement. It would enable the faculty and staff, in partnership, to focus on shared goals for strengthening the quality of student attainment as it avoids the repetition of the day-to-day, well-understood processes to repeat redundantly and effectively manage them. So, computerisation paves the way for better management, better dissemination of information, better leverage on decision assistive systems, and better processing of tasks in a University.

A University's epicentre of business module is academic, i.e teaching, learning and examination modules. All the other modules like HRMS, finance, planning & development, administration, act as the dependent modules towards the core business. Naturally, the main

objective and prime focus of the software system shall be putting in place the teaching, learning & examination modules, which shall transform the operations in the service and operational levesl. The software system must be capable of providing accurate full-fledged MIS (Management Information System) solutions across organizations and collectively, with audit trail and decision assistive capability

Context

Most Universities in have been using computer-based technology, some of for more than two decades, but without attaining the desired efficacy in the quality of service and outcomes. Although, a few Universities are claiming for its success in the area of e-governance, actual conditions at the level of operation and results seldom vouch for it. In most universities a unit operates solely for the computerization of various services related to examination starting from the registration process followed by the conduct of examinations and result in processing to the awarding of certificates to the students. It is like a bubble facing challenges and barriers in software development as well as management.

The context of this rapid appraisal is the dire need for resolving the problem of retardation in the process of computerisation due to several hindrances. An objective identification of the hindrances is crucial to move forward to attain the goal of computerisation with professional standards and quality of the industry. What measures would resolve the stalemate is the question as well as the context of this hindrance appraisal.

Hindrances Faced by the Universities

There is a large number of potential barriers in the implementation of e-Governance within each University. Some are serious hindrances in the path of implementation, like lack of properly defined business rules (functional and non-functional),

Serious Lacks

- Lack of policy-defined process-handling within the organization; lack of uplifting of business rules; and lack of business process reengineering (BPR - step reduction) efforts; lack of predefined quality controlling measures; and lack of user discipline in handling the critical process.

- Generally, no defection preventive measures are taken to deliver an effective system.

Uncontrolled Alterations

- Introduction of exceptions at all phases of the process-lifecycle demanding for alterations of critical SEED data (base data) at any point of time. It forces alterations into the critical data, upsetting the software. (A software alteration is made only when it is a must, and done judiciously for safe-guarding the cause of the basic user clientele).

- Unequal access of the users, their resistance to change, and uncontrolled WANT outside the scope of the project (Change means forging ahead for ensuring optimal benefits from the technology while resistance means blocking it by forcing drudgery into ithe technology).

Unsatified Needs & Escalating Cost

- Computerisation of Universities by themselves hardly succeeds in meeting the NEEDS and all the added efforts towards the goal ends up only in added expenditure.

- Improper planning and execution of IT enabled services (ITE's) without considering the impacts in the process lifecycle lead to serious data integrity issue and piling up of unwanted works at various levels in every University in the State. This in turn leads to deadlocks and blockage of service to the beneficiaries.

- Each university, constrained to develop softwares for the ease of the middle level functionaries in the administration, always fails to ensure business continuity and the care for service layers.

- Almost every University has not succeeded in giving priority to the business outcomes and quality of services of the Organization.

- Down the line, it is more than 10 years of computerization of Universities now. In most Universaities all SDLC policies are bound to be lifted and operated as per low/middle management's whims and fancies heading for an all the more dubious state.

- A bubble like Software System inevitably faces critical hindrances in the path of implementation due to the lack of well-defined business rules with no policy framework guided process, outdated business rules (age old manual rules are still forced to be automated, which will not yield any efficiency rather building inefficacy), leading to serious operational mismanagement in all walks of process life cycle.

- Every process is undergoing seamless exceptions and changes on all phases during the process life-cycle, which needs to be strictly controlled through a stable policy definition and standards (ISO).

- Uncontrolled SEED data (academic definitions & Rulesets) alterations at any point of time throughout an active lifecycle leading to serious exceptions at all phases of operations triggering files and leading to mismanagement and overhead at sections and at the technical team's end. The end result is the service layer becoming seriously defunct over time. At present technical teams spend most their time in managing unproductive changes and error corrections, Overloaded with futile tasks of change management, the technical staff fail to produce any sustainable outcome.

- Lack of unclear vision and business goals, leading to failure in the re-engineering process. Good initiatives are to be taken to reengineer the age old manual rules focusing the global trends and quality of service, which is never happening with in the organization citing age old obsolete rules and regulations

- The system is forced to operate on old business rules and practices (precedences) more tham two decades old. No steps/measures have been taken to refine and update the rules and procedures. At the same time certain UC based rules and regulations are changed with out considering the impact on the system.

- Bypassing or manually overriding the software leads to huge volume of overhead generation at all phases of operation (eg: emailing question papers to colleges having no registration in secure online QP transmission software, regularising cases outside the software etc).

- A big challenge is the issuance of special orders impeding even the critical process flow and forcing software alteration each time excluding the scope and business rules, and service factors of the operations. It does not facilitate financial auditability, accountability and accuracy.

- Middle/Low levels' ease of operation gets propritised as prime improvisations in the software, at the expense of the primacy of clientele services or business-related services. Software operations and functionalities are forced to adhere to low/middle level management WANTS resulting in deviation of business outcomes.

- Software system in the University is doomed due to the uncontrolled WANT of middle level users and due to non-compliance with the business continuity, process refinement, and quality assurance across the process lifecycle.

- Generally, excess in the number of operators is a problem for the systemic failures. Only the actually requitred number of operators shall be employed in order to ensure the

optimal benefit of computerisation. Excess operators spoil operational efficiency, accuracy, timeliness and refinement over time, besides bringing in unwanted drudgeries.

- Actually software developers are bound to develop software with the requirement of low/middle level management, who do not have a higher level perception of the organization, seriously contradicting the organizations business interest.

- In our universities during every 4 year duration the business interests get totally misaligned; priorities and mode of operations undergo serious changes adversely affecting the backbone of the core software system.

- On an average every University is holding less than 50 processes (less than 20 HIGH LEVEL processes remaining are subprocesses). If these are well defined, there is no serious technical challenge in computerizing our organizations. At present a single process is being handled in 'n' number of ways across sections, which is the major reason for defunct service deliverability.

- There is no accountability regarding the process involved in the business. Each branche (Academic, Finance, Planning & Development, Examination, Teaching, Research, Students, Services) acts individually in its area, despite being unaware of its impacts on other branches. If serious computerization is planned all the branches would operate in-line under the organization.

- It is inevitable that there must a powerful leadership imbued with technical skill, technological knowledge, imagination in high level computerization, and a fairly good understanding of the institution's business.

- It is equally inevitable that the institutional authorites respect the leadership and the expert team in the Industry without which the amateurish interventions will crack down the system. At present technical team is being treated as low level employees and the middle and lower level administrators ignorant of the consequences give instructions.

- If the below suggested corrective measures (10 years observation and hands on experience on the real system) could be implemented, It is 100% sure that Universities shall operate on a very innovative, efficient, cost effective manner offering a multitude of student friendly services and thereby generating income with most minimum complaints.

- Handing over the present situation to a third party organization for computerization will not yield the desired outcome. Initially the organization should be prepared with its accountable operations to be computerized (which is 100% lacking at this moment also).

Once the organization gets prepared with its requirement, technology deployment is not going to be a serious challenge, any third party could be introduced at this juncture, if needed.

Standards Important

Successful organizations recognize standards as business tools that should be managed alongside quality, safety, intellectual property, and environmental policies. Standardization leads to lower costs by reducing redundancy, minimizing errors or recalls, and reducing time to market. Organization should strictly decide on which standards are to be followed (ISO - Quality Management ISO 9000, ISO 9001, Auditing ISO 19011, Environmental Management ISO 14000, ISO 14001, Risk Management ISO 31011, Social Responsibility ISO 26000 etc.)

- Awareness can only help bring users to that service delivery channel once. Procedures need to be simplified to deliver concrete benefits and clear guidelines provided to encourage their use by the actual end-users and reduce user's dependence on intermediaries. Software should be focused on clientele related service delivery rather than on operational user comfort.

- HIGH LEVEL management should control the business process, VISION and SCOPE of the computerisation project. A well-developed plan with clear goals and expected service oriented outcomes covering the entire COURSE SCOPE with innovative business models in alignment the global academic trends.

- To have an effective system, every process should be categorized into functional and non-functional requirements. The business rules, pain points, known and anticipated exceptions are to be incorporated to evolve a well engineered system of optimal efficiency - The required data and plans should be collected and organized by the Functional team (HIGH LEVEL-Business rule building and refining team) in consultation with the Subject matter experts, existing business rules, Guidelines, U.O's, G.O&'s, KSR, KSSR, and other Statutory user requirement collection plans adopted. All process and operations should be auditable as per ISO standards.

- Unification of process and reports are to be adopted in the organization. Standard operating procedures are to be built and strictly followed across all branches pertaining to standards.

- Data integrity can be maintained through the use of various error checking methods and stringent Quality assurance methods across processes. A HIGH level quality assurance team should be operated as per ISO standards.

- Visionary-planned computerization should fall in and as per the software's scope and requirements the entire sections/users should operate. This will bring in well aligned planned outcomes.

- If we could manage to bring in the above corrective measures in the organizations way of operation this will pave the path for efficient computerization and may operate on less than 20% present staff strength effectively.

- Every organization makes repetitive business decisions. These decisions are made by following the organization's business policies. Business policies are the guidelines developed by an organization to govern its actions. The policies define the limits within which decisions must be made. The business rules are the interpretation of these business policies. The business rules enable policies into practice. But it is visible that most organizations under HIgher education are operating on age-old, vibrant policies which are misaligned with the scope of the business, which needs stabilization and improvisation adhering to Nationally/Globally benchmarked standards and stabilized guidelines (G.O's/U.O's).

- For the examination system to operate seamlessly the major critical dependent factor is the academic definitions (SEED DATA for the Core Business). Therefore the academic module stands as the basement for the entire operations of the teaching, learning, and examination modules, hence the stability and quality of these definitions are mandatory for the examination wing to operate and provide student services seamlessly.

- It is identified that the academic definitions (rules, regulations, curriculum, and scheme) are frequently altered untimely across the organizations leading to ambiguity in the dependent operational areas. Auditability on process handling (manually or digitally) is least/not maintained across the organizations, even financial auditabilities are also not well maintained.

- This hindrance contributes to more than 40% of the uncertainty at multiple phases in examination-related operations and student services. Another 50% of the issues are generated due to ambiguous rules, defunct policies, improper planning, and a lack of standard operating procedures.

- Most organizations have digitized or partially automated the existing manual method maintaining the prevailing staff pattern and workflow leading to dubious outcomes, which makes it impossible to attain the desired outcome. In such kind of digitization, auditability, data integrity, security, and critical service rendering layers cannot perform at optimum. Mostly 90% of the business shall be handled using this software in a limited manner but may not be possible to attain 99% or above accuracy, efficiency, and quality of service using such decentralized mismanaged systems.

- Multiple software was built to handle exigent situations, which are mostly nonscalable, interoperable, and are not clientele service-centric. In order to handle a particular situation without proper specifications (unavailable during that point in time where conceptualization happened) most of the software was built on a war footing manner without proper requirements and specifications, which is underperforming and is triggering exceptions due to improper limited planning and instantaneous implementation.

- The deployment of such unprofessional software is leading to financial and data integrity loss across organizations. Hence the scope of improvement on such systems is too limited due to the irreparable damages prevailing on the data sets and serious scope, functionality deflections.

- Software development wings are not well formulated, operated, and managed. In most cases the development wings operate under Middle-level management. In systems engineering, information systems, and software engineering, the systems development life cycle (SDLC), also referred to as the application development life cycle, is a process for planning, creating, testing, and deploying an information system. The system development life cycle concept applied to a range of hardware and software configurations.

- There are usually six stages in this cycle: requirement analysis, design, development and testing, implementation, documentation, and evaluation. SDLC policies are not followed or major stages are omitted across organizations due to proper understanding of the stages by the middle management

- The age-old work allocation pattern needs a face change along with the implementation of computerization, but this has been adapted on a very limited scale in few organizations.

- Conventional age-old process/policy definitions (even 30+ year old obsolete rules are being digitized) are followed in most Organizations, due to this Software based digitization has only happened in most cases, which shall not yield the desired/optimum benefits in its service layer and in the decision assistance layer rather partially solving a situation, making the system more complex on other different phases. BPR based, scope-bound systems seem to be a rarity across organizations.

- A single process is handled, replicated, or interpreted with multiple modalities across sections/branches/programs within and across organizations. Process unification or standardization efforts are barely attempted leading to a serious delays in service deliverability. The extent of the area or subject matter that something deals with or to which it is relevant (scope) is not restrained across organizations.

- Successful organizations recognize standards as business tools that should be managed alongside quality, safety, intellectual property, and environmental policies. Implementation of standards leads to lower costs by reducing redundancy, minimizing errors or recalls, and reducing time to market. No particular operational standards seems implemented across the organizations.

- U.O's pertaining to business rules are being modified 'n' number of times by different authorities and multiple versions are being followed across multiple phases of service leading to ambiguity and serious integrity loss on various business values. Business continuity and cross-process impacts are least considered in the present scenario by employees and by authorities (sections carry out their work without knowing/assessing impacts on the change management attempted across other sections/branches/process and its clientele)

- An organization's business continuity (process flow from beginning to end) is not visualized, documented, or least managed across most of the Universities. Vision relating to the uplifting of the process involved in the business across the entire business lifecycle has not been attempted (some minor attempts on some intermediary processes are visible but are not sustaining). Attempts have been made by some Universities on some processes to attain a particular result set (BPR - step reduction efforts are barely seen across organizations) but collective efforts for improvisations of the entire business lifecycle are hard to find.

- Business continuity, financial aspects, and service aspects are least considered across most of the organizations in the present scenario, software is built more towards the

operational ease of the employees within the organization which is a true contradictory factor while computerizing an organization's business plans. Organizations' business outcomes (An organization's business rules and policies need to be transformed into the software) and quality of services delivered shall be the prime consideration upon which the roles should act.

- No well-defined policy-oriented process handling is followed in the majority of the cases, due to this processes are being handled by the employees in an undisciplined manner leading to unwanted seamless exceptions which are being forced onto all phases of the process lifecycle. Many other exceptions are triggered due to untimely futile decisions/changes forced into the system by multiple power sources. Each of these contributes to the piling up of drudgeries at multiple levels and leading to deadlock situations and to a total collapse in the near future.

- Uncontrolled seamless critical SEED data *(base data on which the system operates - academic definitions including subject codes, credits, streams, faculty,* total credits, affiliation and seat matrix, student registrations, fees, teachers mapping, question paper codes, timetables, etc.) alterations at any point of time, No predefined quality controlling measures adopted, No user disciplines in handling critical process, as per orders or due to mismanagement any critical data/software alterations are being forcefully inducted into the software without ascertaining its impacts and aftermath. Data integrity and auditability are seriously affected in such environments.

- Every four year due to the lack of an inherent policy-oriented framework the business interests are getting totally realigned under new management, and priorities and modes of operations are undergoing a serious turnaround which is adversely affecting the universities core business backbone and business continuity. Lack of proper Vision-driven Mission, Missions are aborted abruptly midway due to the change in management for want of another set of reforms.

- Despite the initial and recurring high cost incurred for setting up and running the e-governance infrastructure at the University level, there is no satisfactory improvement in the delivery and efficiency of services; clientele empowerment; better accessibility to information; and enhanced transparency of administration.

Corrective Measures

- Universities should continuously focus in the standardization of data, process, interoperability in e-governance applications, and discovering more innovative avenues for delivering e-services effectively and economically.
- Awareness alone can help bring users to the service delivery channel once. It cannot guarantee sustained use of the system unless the system is also designed in such a way as to deliver a satisfactory outcome.
- Procedures need to be simplified to deliver concrete benefits and clear guidelines provided to encourage their use by the actual end-users and reduce user's dependence on middlemen/intermediaries.
- We should stop independent software development and operation as bubbles with limited scope in the different wings of the university. This in totally non-professional precluding the possibility of professional computerisation.
- The software development team should operate as a single unit under the supervision of HIGH LEVEL visionary management. This sole competent team must handle the entire computer process of the University, in order to ensure operational continuity and optimal benefits of the technology.
- Before moving into computerization in the professional way the primary prerequisite is the identification of the needs of each branch/wing and the detailed defining of Universities' operational process lifecycle. This must be a thorough process of identification, documentation and re-engineering strictly adhered to ISO standards.
- At this initial point of software development the University must have a clear perspective regarding the operational continuity of the software from A to Z. All business rules must be unambiguous, traceable and very well-defined.
- All processes should be auditable with ISO standards of operation to ensure the quality, safety, accountability and efficiency of the business, services, systems and deliverables of the University.
- The University should continuously focus on the standardization of data, interoperability in e-governance applications, and seek more innovative avenues for delivering e-services effectively.

- It is high time we have adopted above mentioned corrective measures in order to attain the intended objectives of e-governance implementation at the Universities.

Once these requirements are satisfied, software development will fall in line efficiently. However, it is hard to satisfy the conditions, because the present situation of non-compliance with the business continuity, process refinement, and quality assurance across the process lifecycle will continue, unless there is a unified control.

Alternative

What emerges from the above description is that Universities' efforts in computerisation are in a stalemate due to several hindrances. Hardly do the Universities seem to succeed in taking effective remedial measures to steer clear because the hindrances are contingent and rooted in the basic contradiction of combining the traditional file processing with the ICT enabled governance. In such a setup of mismatch, the control will be in the hands of the intermediaries in the general administration, and the technology will fail to yield expected outcomes. In the existing conditions computerization cannot attain its desired outcomes in the Higher Education regime with a future-proof focus on global educational trends. With the current decentralized distributed system aligning educational trends or generating a decision-assistive system is impossible. There must be a centralized agency to continuously focus on the standardization of data, processes, interoperability across e-governance applications, and discovering more innovative avenues for delivering e-services effectively and economically.

- The alternative is the establishmwent of a system of centralised monitoring and control of IT infrastructure. It is high time we have sought to establish and maintain a Statewide centralized, policy-bound, re-engineered, stabilized, scalable system in place which shall cut across the entire academic ecosystem with strict quality assurance standards.

- A Centralized IT infrastructure (Business process refinement and software management team) is essential to control the software scope of the Universities adhering to global benchmark standards in accordance with the applicable guidelines/frameworks set by the National/Global/Govt agencies.

- A Centralised set up is essential for an auditable and resource-frugal ERP solution with a fully engineered, uplifted process with the foolproof scope of adhering to national/global standards with unified process and functionalities.

- All Universities are operating on the same business, hence the underlying processes are almost similar and address the same cause, but are managed and operated in a multitude of ways. These operations shall be optimized and standardized centrally with better scalability, visibility, transparency, auditability, while maintaining the quality of service.

- A Centralised control alone can maintain a strict operational policy and provide all universities the flexibility to define new academic programs and operations adhering to the scope of Enterprise Resource Planning (ERP). This will effectively control the existing practice of bringing about untimely and inappropriate changes across entities, because the centralised system shall be operated by a closely knit visionary group.

- The centralised system amounts to a paradigm shift in software deveopment and operation in the Universities.

- ERP is a business management software that allows an organization to leverage a suite of integrated applications. ERP systems streamline and automate processes, creating a leaner, more accurate, and more efficient operation. ERP provides complete visibility into core business processes.

- An adapted ERP system with globally benchmarked standards having a true focus on the major business processes like academic, finance, HRMS, examination, learning management, clientele services, and MIS (Management Information System) has to be envisaged at this juncture of centralisation.

Challenges

What the document has reviewed and summarised are the main hindrances of computerisation of Universities individually at the practical level. There are not too many serious technology-related challenges (technology inception related no casualties are to be anticipated) involved in this project. If requirements related to the projects are finalised, hardly do we have many options available regarding software procurement (development/purchases/SaaS). The major challenge lies in the stabilisation of procedures (closing all possible loopholes and pain points involved in the present system, uplifting of process and to address the known unavoidable exceptions in Govt sector), globalization of framework and requirement finalization. About eighty percent of the effort lies in this area, which needs to be addressed strongly on all phases.

Till date, the seriously wrong approach taken by most Universities is to discuss the process defined on any shabby software. After a massive meeting problems are resolved but only for the time being. The root cause remains unidentified and hence no measures taken to address the complex area). Adopting interim corrective measures focused on developing software functionalities where the process scope is being defined or re-engineered (if so) by technical people (where the process refinement/definition is carried out in technical people's perspective only) Inherent guiding rules stand apart. This approach is totally wrong and would not work in the real world, because it is quite a simple task for a group of technical roles to convert or refine a process if rules and regulations (if rules are unambiguous and are not wrongly interpreted) are provided. Most of the time this happens from a single point of view (technical angle), which may operate well in other sectors if the management perspective is also covered. In the case of Universities, while refining a process we should consider multiple angles (rule refinement considering clientele future-proof needs, academic trends, social impacts, inherent government sector unavoidable exceptions, and existing pain points - both functional and non-functional) otherwise the system shall be too rigid to operate in the desired environment. These angles are to be considered and strict exception handling is to be incorporated into the system without affecting the software's auditability.

It is quite possible to build a global framework for Universities without seriously affecting the autonomy of the organisation (standardisation of rules and regulations, operational policies, and work culture are needed, eg: admission rules standardization, academic definition scope and stability, Grace mark models, moderation are the major critical process needs strict refinement on policy, that too from multiple angles (Gracemark rules are quite impossible to be implemented into the software without refining the present *modus operandi* - lot of external factors and time points are affecting the process stability and the major killer process for the entire operations at the present time point). The software developed shall be an operational limiter or frame for the entire operation, through the software a well-structured work culture (functionality/feature-based roles and responsibilities) and strict quality control measures are to be brought in. This shall change how the organisation operates.

Two Approaches

1. Build a centralised software with strong process policy binding and each organisation shall adhere to the operational policies defined by the software (there shall be well-defined multiple models for a process - this software policy shall become the governing order superseding the existing old orders at each entity). Time to market will be less in this model (but more work at the central point). Entire organisations' operations (pain points and scalability need to be addressed) are going to be well defined using this software, hence each organisation's

autonomy is not seriously impacted but every operation becomes disciplined and accountable (nowadays organisations' autonomy is misunderstood as making any changes at any point in time. This attitude will take a serious hit and on the other side most of the autonomy remains unchanged but becomes disciplined and operational within the scope protecting the autonomy of each entity).

2. Refine all processes, build or amend respective orders (Statutes, University Orders etc) and build software as per the new guidelines and implement. It is a time-consuming unending process. A single-line requirement for the project is quick and continuous service from A to Z to the academic community, especially to the student community. While a student joins a Programme, the system shall be capable of providing an exact timing (academic calendar) for the student including the details of the courses for study, dates of examinations and result throughout the Programme period, and shall be capable of providing the Degree Certificate (unmanned with 99.99% above accuracy) the very next day after the publication of the final result.

If this needs to happen all processes from the very beginning till the end should operate in a well-contained disciplined, and timely manner for the software should guide and adapt to the situation involving mutiple functions like the conduct of examinations, allocation of associated resources, mobilisation of teachers, preparation of schemes, and assignment of answer sheets etc..

Integration of the Existing Software

Most organisations have multiple software built on multiple technology platforms on multiple versions addressing the same matter. Most of them are shabby in design and scalability perspective, unddergone serious interventions without maintaining proper coding standards and SDLC policies. Technical integration might be possible after comparing softwares and technologies. This involves a lot of complex challenges and a massive workforce by the technical team and may not lead to the desired quality outcome (in order to do this also a proper stable plan should be ready at the Control end regarding the final requirements from the project). Hence the considered advice is to build/hire/procure an ERP that addresses the State level plan and vision of Higher Education for the futuristic requirement.

What needs to be automated and for what outcome (80%) is the initial focus and that constitutes the major criterion for the success of the project. Focusing on how to automate is the final part (20% comfortable part). The stability, depth, unambiguity, and quality of this area lead to Good Software (Software from scratch or integration of existing software). Sadly, this

area is never addressed in our Universities. A previous attempt at State level centralisation failed due to this inept handling of the software needs, dubious and indisciplined. How to manage, if the Universities come up with multiple needs and exceptions, is the biggest challenge for the Project of centralisation.

The Kerala State Higher Education Council

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